

IN THE UNITED STATES DISTRICT COURT
FOR THE SOUTHERN DISTRICT OF TEXAS
HOUSTON DIVISION

UNITED STATES OF AMERICA	§	
	§	
v.	§	Criminal No. 4:21-cr-00009
	§	
ROBERT T. BROCKMAN	§	UNDER SEAL

DEFENDANT ROBERT T. BROCKMAN'S
PRE-HEARING MEMORANDUM
REGARDING COMPETENCY DETERMINATION

APPENDIX OF RELEVANT MEDICAL TERMS

1. Physical Conditions

- a. **Parkinsonism** is any condition that causes a combination of movement abnormalities seen in Parkinson's disease—tremor, slow movement (bradykinesia), postural instability, impaired speech, muscle stiffness.
- b. **Parkinson's disease** is a progressive neurodegenerative disease that affects movement, and may result in rigid muscles, slow movement, impaired posture, and tremors. Parkinson's disease is incurable. The presence of Lewy bodies in the brain is a marker for Parkinson's disease.
- c. **Lewy bodies** are abnormal protein deposits (made up of alpha-synuclein) that develop and build up within neurons in various brain regions involved in movement, thinking, and memory.

2. Cognitive Conditions and Cognitive Decline

- a. **Parkinson's disease** is often associated with cognitive decline. "Cognitive decline in PD is a continuous process affecting nearly all patients over time, and the demarcations between the four cognitive groups"—**cognitively normal, subjective cognitive decline, Parkinson's disease with mild cognitive impairment, and Parkinson's disease dementia**—are not strict. Dag Aarsland, *Cognitive Decline in Parkinson Disease*, NAT. REV. NEUROL., April 2017, at 3.

- b. **Subjective cognitive decline** are cognitive impairments “noted by the patient, family members or health personnel, but cognitive test performance is in the normal range. In the general population, SCD is associated with an increased risk of future cognitive decline, that is, progression to MCI or dementia, including Alzheimer’s disease.” Dag Aarsland, *Cognitive Decline in Parkinson Disease*, NAT. REV. NEUROL., April 2017, at 3.
- c. **Mild cognitive impairment (MCI)** is a form of cognitive impairment that is not severe enough to interfere with or impair daily life (social, occupational, or personal care). “[R]ecent research has established the high frequencies of SCD and MCI as harbingers of dementia in PD.” Dag Aarsland, *Cognitive Decline in Parkinson Disease*, NAT. REV. NEUROL., April 2017, at 16.
- d. **Dementia** is a marked progressive impairment of cognitive abilities that may include memory, attention, language, visual-spatial abilities, and executive functioning. Dementia is distinguished from mild cognitive impairment in that these cognitive impairments affect a person’s ability to perform everyday activities. Dementia has many causes.
- e. **Parkinson’s disease dementia (PDD)** is a term used for progressive dementia that develops after exhibiting motor symptoms associated with Parkinson’s disease. Unlike MCI, PDD involves cognitive impairment that is severe enough to interfere with or impair daily life. In PDD, dementia appears after the development of motor symptoms associated with Parkinson’s disease. The risk of developing dementia for individuals with Parkinson’s disease is high, with the development of dementia occurring among Parkinson’s disease patients with a prevalence of approximately 70%. See Celia Painous, *Cognitive Impairment in Parkinson’s Disease: What We Know so Far*, JOURNAL OF PARKINSONISM & RESTLESS LEGS SYNDROME 10 (2020): 7.
- f. **Dementia with Lewy bodies (DLB)** is a type of progressive dementia that causes problems with memory and thinking abilities that are severe enough to interfere with everyday activities. It affects a person’s ability to plan and solve problems (called executive function), and their ability to understand visual information (visuospatial function). Core symptoms include fluctuating symptoms, visual hallucinations, Parkinsonism (muscle stiffness and slowed movements) and REM sleep behavior disorder in which people demonstrate motor symptoms during sleep as if they are acting out dreams. In DLB, dementia usually appears prior to the onset of motor symptoms associated with Parkinson’s disease. In DLB, Lewy bodies are deposited first in the part of the brain responsible for cognitive functions.

- g. **Alzheimer's disease** is a type of progressive brain disease, meaning that it becomes worse with time and it is ultimately fatal. Alzheimer's disease is the most common cause of dementia, accounting for an estimated 60%—80% of cases. 2021 ALZHEIMER'S DISEASE FACTS AND FIGURES at 5 (*available at* <https://www.alz.org/media/documents/alzheimers-facts-and-figures.pdf>).
- i. **Symptoms:** Symptoms of Alzheimer's disease are global, meaning that although they involve impairment of short-term memory in its earliest stages, they inevitably affect attention, language, perception, motor skills, recognition, organizing, planning, insight, and judgment—all skills until the afflicted person eventually becomes mute and unable to walk and even swallow prior to death.
- ii. **Hallmark Pathologies:** There are several brain changes that are the hallmark pathologies of Alzheimer's disease. These brain changes are considered biomarkers of Alzheimer's—that is, biological changes that can be measured to indicate the presence/absence and risk of developing Alzheimer's disease. Brain changes associated with Alzheimer's disease include: (1) the accumulation of an abnormal, toxic protein in the brain called beta-amyloid (these clumps are called beta-amyloid plaques); (2) the accumulation of a toxic protein in the brain called phosphorylated tau within neurons (producing structures called neurofibrillary tangles); and (3) inflammation and atrophy of the brain (that is, decreased brain volume). ALZHEIMER'S DISEASE FACTS AND FIGURES at 6 (*available at* <https://www.alz.org/media/documents/alzheimers-facts-and-figures.pdf>).
- iii. **Coexistence of Alzheimer's Disease and Parkinson's Disease:** Alzheimer's disease frequently coexists with dementias associated with Parkinson's disease. "In PDD brains, Alzheimer's disease (AD)-type and LB-type pathologies frequently coexist, suggesting that there are interactions between α -synuclein, tau, and amyloid- β ($A\beta$) protein aggregates." Celia Painous, *Cognitive Impairment in Parkinson's Disease: What We Know so Far*, JOURNAL OF PARKINSONISM & RESTLESS LEGS SYNDROME 10 (2020): 8.
- h. **Confabulation** is a neuropsychiatric disorder wherein the patient generates false memory without the intention of deceit. The patient believes the statement to be truthful, and generates the information as a compensatory mechanism to fill in holes in memory.

- i. **Delirium** is an acute disorder of attention and cognition. Delirium is significant for a number of reasons.
 - i. **Brain Vulnerability:** Delirium is “a marker of brain vulnerability with decreased cognitive reserve.” Sharon Inouye et al., *Delirium in Elderly People*, LANCET, Mar. 8, at 1. That is, the leading predisposing risk factors for developing delirium are “dementia or cognitive impairment... and advanced age (> 70 years).” *Id.* at 5. “[A]n episode of delirium can signal vulnerability of the brain with decreased cognitive reserve and increased risk for future dementia. In some cases, delirium may bring previously unrecognized cognitive impairment to medical attention. Delirium and dementia commonly coexist, with dementia being a leading risk factor for delirium, i.e., increasing delirium risk by 2-5 fold on hospital admission.” *Id.* at 9-10. There are a number of relatively benign precipitating factors that can lead to delirium including, among others, “[p]hysical and/or psychological stress.” Giuseppe Bellelli et al., *Delirium: A Marker of Vulnerability in Older People*, FRONTIERS IN AGING NEUROSCIENCE, April 30, 2021, at 4.
 - ii. **Permanent Cognitive Damage:** Delirium is “a potential mechanism for permanent cognitive damage.” Sharon Inouye et al., *Delirium in Elderly People*, LANCET, Mar. 8, at 9-10. Accumulating evidence “lends strong support for the impact of delirium itself contributing to and/or being a mediator of permanent cognitive impairment.” *Id.* at 10.
 - iii. **Accelerated Cognitive Decline:** “Among older patients with dementia, delirium is associated with increased rates of cognitive decline[.]” *Id.* at 4. “[C]ognitive deterioration following delirium proceeds at twice the rate in the year after hospitalization compared with patients who did not develop delirium.” Alden L. Gross et al., *Delirium and Long-Term Cognitive Trajectory Among Persons with Dementia*, ARCH INTERN MED., Sept. 24, 2012, at 1324.
 - iv. **Increased Risk of Mortality:** Delirium is “associated with an increased risk for death.... The 1-year mortality for hospitalized seniors who develop delirium is 35% to 40%.” *Id.* at 1324-25. “Delirium is consistently associated with an increased mortality rate across all nonsurgical patient populations.... [P]atients with delirium in the emergency department have an approximately 70% increased risk of death during the first six months after the visit” Sharon Inouye et al., *Delirium in Elderly People*, LANCET, Mar. 8, at 3.

3. Neuroimaging Information

- a. **Neuroimaging** is the process of producing images of the structure or activity of the brain by using techniques such as **magnetic resonance imaging (“MRI”)**, **positron emission tomography (“PET”) scans**, and **single photon emission computed tomography (“SPECT”) scans**. These techniques assist in the diagnosis and evaluation of mental disorders. Neuroimaging studies such as PET scans and MRIs assist in the diagnosis of neurocognitive disorders, including Alzheimer’s disease.
- b. **MRI scans** are a type of imaging technique that offer high resolution images of brain structures, and permit the detection of atrophy or brain tissue loss (e.g., associated with Alzheimer’s disease and other dementias) and other deformations of the brain.
- c. **PET scans** involve the injection of a small amount of radioactive tracer that allows for an evaluation of the metabolism or presence of abnormal proteins in the brain, providing information about the functionality and structure of the brain. In this case, two types of PET scans have been conducted:
 - i. **FDG-PET scans** involve the injection of Fluorodeoxyglucose (hence FDG-PET); and
 - ii. **Amyvid PET scans** involve the injection of a different compound, 18F-florbetapir (a.k.a. Amyvid). Amyvid is one of three FDA-approved imaging agents used to estimate the density of beta-amyloid plaques in the brain, an indicator of Alzheimer’s disease.
- d. **SPECT scans** involve the injection of a small amount of radioactive substance (e.g., DaTscan) that allows doctors to analyze the function of the brain. A DaTscan measures the number of dopamine transporters in the brain region critical for movement, and helps diagnose Parkinson’s disease.